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Relevance scale **1** [Pointing and manipulation: An interface for creating and manipulating curves using a](#) [high degree-of-freedom curve input device](#)

Tovi Grossman, Ravin Balakrishnan, Karan Singh

April 2003 **Proceedings of the SIGCHI conference on Human factors in computing systems**

Publisher: ACM Press

Full text available:  [pdf \(2.00 MB\)](#)Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

Current interfaces for manipulating curves typically use a standard point cursor to indirectly adjust curve parameters. We present an interface for far more direct manipulation of curves using a specialized high degree-of-freedom curve input device, called ShapeTape. This device allows us to directly control the shape and position of a virtual curve widget. We describe the design and implementation of a variety of interaction techniques that use this curve widget to create and manipulate other v ...

Keywords: curve editing, high degree-of-freedom input**2** [Exploring interactive curve and surface manipulation using a bend and twist sensitive](#) [input strip](#)

Ravin Balakrishnan, George Fitzmaurice, Gordon Kurtenbach, Karan Singh

April 1999 **Proceedings of the 1999 symposium on Interactive 3D graphics**

Publisher: ACM Press

Full text available:  [pdf \(716.04 KB\)](#) Additional Information: [full citation](#), [references](#), [citations](#), [index terms](#)**Keywords:** 3D modeling, ShapeTape, bimanual input, curves, gestures, input devices, interaction techniques, surfaces**3** [Manipulating space: Tangible NURBS-curve manipulation techniques using](#) [graspable handles on a large display](#)

Seok-Hyung Bae, Takahiro Kobayash, Ryugo Kijima, Won-Sup Kim

October 2004 **Proceedings of the 17th annual ACM symposium on User interface software and technology**

Publisher: ACM Press

Full text available:  pdf(2.07 MB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

This paper presents tangible interaction techniques for fine-tuning one-to-one scale NURBS curves on a large display for automotive design. We developed a new graspable handle with a transparent groove that allows designers to manipulate virtual curves on a display screen directly. The use of the proposed handle leads naturally to a rich vocabulary of terms describing interaction techniques that reflect existing shape styling methods. A user test raised various issues related to the graspable ...

Keywords: NURBS-curve manipulation, automotive design, graspable handle, graspable user interface, large display, two-handed input

4 Projectors: advanced graphics and vision techniques

 Ramesh Raskar
August 2004 **Proceedings of the conference on SIGGRAPH 2004 course notes GRAPH '04**

Publisher: ACM Press

Full text available:  pdf(6.53 MB) Additional Information: [full citation](#)



5 Facial modeling and animation

 Jörg Haber, Demetri Terzopoulos
August 2004 **Proceedings of the conference on SIGGRAPH 2004 course notes GRAPH '04**

Publisher: ACM Press

Full text available:  pdf(18.15 MB) Additional Information: [full citation](#), [abstract](#)



In this course we present an overview of the concepts and current techniques in facial modeling and animation. We introduce this research area by its history and applications. As a necessary prerequisite for facial modeling, data acquisition is discussed in detail. We describe basic concepts of facial animation and present different approaches including parametric models, performance-, physics-, and learning-based methods. State-of-the-art techniques such as muscle-based facial animation, mass-s ...

6 User experience with alignment of real and virtual objects in a stereoscopic augmented reality interface

Ming Hou
November 2001 **Proceedings of the 2001 conference of the Centre for Advanced Studies on Collaborative research**

Publisher: IBM Press

Full text available:  pdf(242.48 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)



This paper reports two virtual pointer alignment experiments carried out using a stereoscopic augmented reality interface. The purpose was to evaluate users' sensitivity to surface texture, target position at designated probe points on a cylinder real object surface, virtual pointer form and binocular disparity. The results confirmed the main findings from a previous study: that both surface texture and target position have significant influences. Subjective evaluation of virtual pointer form re ...

7 Digital tape drawing

 Ravin Balakrishnan, George Fitzmaurice, Gordon Kurtenbach, William Buxton
November 1999 **Proceedings of the 12th annual ACM symposium on User interface software and technology**

Publisher: ACM Press

Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index](#)



Full text available:  pdf(517.47 KB)[index terms](#)

Tape drawing is the art of creating sketches on large scale upright surfaces using black photographic tape. Typically used in the automotive industry, it is an important part of the automotive design process that is currently not computerized. We analyze and describe the unique aspects of tape drawing, and use this knowledge to design and implement a digital tape drawing system. Our system retains the fundamental interaction and visual affordances of the traditional media while leveraging t ...

Keywords: automotive design, interaction techniques, large-scale displays, tape drawing, two-handed input

8 Two-Handed Interaction: Creating principal 3D curves with digital tape drawing 

 Tovi Grossman, Ravin Balakrishnan, Gordon Kurtenbach, George Fitzmaurice, Azam Khan, Bill Buxton

April 2002 **Proceedings of the SIGCHI conference on Human factors in computing systems: Changing our world, changing ourselves**

Publisher: ACM Press

Full text available:  pdf(943.56 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

Previous systems have explored the challenges of designing an interface for automotive styling which combine the metaphor of 2D drawing using physical tape with the simultaneous creation and management of a corresponding virtual 3D model. These systems have been limited to only 2D planar curves while typically the principal characteristic curves of an automotive design are three dimensional and non-planar. We present a system which addresses this limitation. Our system allows a designer to const ...

Keywords: 3D modeling, interaction techniques, large scale displays, tape drawing, two-handed interaction

9 HandSCAPE: a vectorizing tape measure for on-site measuring applications 

 Jay Lee, Victor Su, Sandia Ren, Hiroshi Ishii

April 2000 **Proceedings of the SIGCHI conference on Human factors in computing systems**

Publisher: ACM Press

Full text available:  pdf(1.49 MB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

We introduce HandSCAPE, an orientation-aware digital tape measure, as an input device for digitizing field measurements, and visualizing the volume of the resulting vectors with computer graphics. Using embedded orientation-sensing hardware, HandSCAPE captures relevant vectors on each linear measurements and transmits this data wirelessly to a remote computer in real-time. To guide us in design, we have closely studied the intended users, their tasks, and the physical workplaces to extract th ...

Keywords: field measurement tool, input device, on-site applications, orientation-aware, physical interaction, tangible interface

10 Advancing interaction: Tangible interfaces in virtual environments for industrial design 

 Raffaele De Amicis, Giuseppe Conti, Michele Fiorentino

May 2004 **Proceedings of the working conference on Advanced visual interfaces**

Publisher: ACM Press

Full text available:  pdf(119.80 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

In the fields of industrial design and car manufacturing the creation of 3D curves plays a fundamental role within the design process: it allows the improvement of the visual appeal of artifacts, it enhances ergonomics and the product's commercial competitiveness through product differentiation. When flexibility and intuition are to be privileged it is fundamental to achieve natural, intuitive, mathematically correct, creation and modification of surfaces. The scientific aim of this research is t ...

Keywords: 3D Curve Generation, Computer Aided Styling (CAS), virtual environments

11 Status report of the graphic standards planning committee

 Computer Graphics staff
August 1979 **ACM SIGGRAPH Computer Graphics**, Volume 13 Issue 3

Publisher: ACM Press

Full text available:  pdf(15.01 MB) Additional Information: [full citation](#), [references](#), [citations](#)



12 Augmented reality / 3D modeling: Conceptual free-form styling on the responsive

 workbench

Gerold Wesche, Marc Droske

October 2000 **Proceedings of the ACM symposium on Virtual reality software and technology**

Publisher: ACM Press

Full text available:  pdf(1.45 MB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#)



A two-handed 3D styling system for free-form surfaces in a table-like Virtual Environment, the Responsive Workbench (RWB)TM, is described. Intuitive curve and surface deformation tools based on variational modeling and interaction techniques adapted to 3D VR modeling applications are proposed. The user draws curves (cubic B-splines) directly in the Virtual Environment using a stylus as an input device. The curves are connected automatically, such that a curve network develops. A combi ...

13 Gaze-contingent displays: Saccade contingent updating in virtual reality

 Jochen Triesch, Brian T. Sullivan, Mary M. Hayhoe, Dana H. Ballard
March 2002 **Proceedings of the symposium on Eye tracking research & applications**

Publisher: ACM Press

Full text available:  pdf(830.24 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)



We are interested in saccade contingent scene updates where the visual information presented in a display is altered while a saccadic eye movement of an unconstrained, freely moving observer is in progress. Since saccades typically last only several tens of milliseconds depending on their size, this poses difficult constraints on the latency of detection. We have integrated two complementary eye trackers in a virtual reality helmet to simultaneously 1) detect saccade onsets with very low latency ...

Keywords: change blindness, eye tracking, limbus tracking, saccade contingent updating, saccades, virtual reality

14 Seeing, hearing, and touching: putting it all together

 Brian Fisher, Sidney Fels, Karon MacLean, Tamara Munzner, Ronald Rensink
August 2004 **Proceedings of the conference on SIGGRAPH 2004 course notes GRAPH '04**

Publisher: ACM Press



Full text available:  pdf(20.64 MB) Additional Information: [full citation](#)

15 [Bender: a virtual ribbon for deforming 3D shapes in biomedical and styling applications](#) 

Ignacio Llamas, Alexander Powell, Jarek Rossignac, Chris D. Shaw
June 2005 **Proceedings of the 2005 ACM symposium on Solid and physical modeling**

Publisher: ACM Press

Full text available:  pdf(873.92 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

In contrast to machined mechanical parts, the 3D shapes encountered in biomedical or styling applications contain many tubular parts, protrusions, engravings, embossings, folds, and smooth bends. It is difficult to design and edit such features using the parameterized operations or even free-form deformations available in CAD or animation systems. The Bender tool proposed here complements previous solutions by allowing a designer holding a 6 DoF 3D tracker in each hand to control the position an ...

Keywords: 6 DOF tracker, adaptive subdivision, biarc, deformation, space-warp

16 [Display of virtual braille dots by lateral skin deformation: feasibility study](#) 

Vincent Lévesque, Jérôme Pasquero, Vincent Hayward, Márlyse Legault
April 2005 **ACM Transactions on Applied Perception (TAP)**, Volume 2 Issue 2

Publisher: ACM Press

Full text available:  pdf(5.58 MB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

When a progressive wave of localized deformations occurs tangentially on the fingerpad skin, one typically experiences the illusion of a small object sliding on it. This effect was investigated because of its potential application to the display of Braille. A device was constructed that could produce such deformation patterns along a line. Blind subjects' ability to read truncated Braille characters ('ˆˆ', 'ˆ•', '•ˆ', and '&bull' ...

Keywords: Braille display, lateral skin deformation, tactile perception

17 [An approach to natural gesture in virtual environments](#) 

Alan Wexelblat

September 1995 **ACM Transactions on Computer-Human Interaction (TOCHI)**, Volume 2 Issue 3

Publisher: ACM Press

Full text available:  pdf(1.53 MB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#), [review](#)

This article presents research—an experiment and the resulting prototype—on a method for treating gestural input so that it can be used for multimodal applications, such as interacting with virtual environments. This method involves the capture and use of natural, empty-hand gestures that are made during conventional descriptive utterances. Users are allowed to gesture in a normal continuous manner, rather than being restricted to a small set of discrete gestural commands as in ...

Keywords: gesture, input methods, multimodal, natural interaction

18 [Virtual clay: a real-time sculpting system with haptic toolkits](#) 

Kevin T. McDonnell, Hong Qin, Robert A. Wlodarczyk

March 2001 **Proceedings of the 2001 symposium on Interactive 3D graphics**

Publisher: ACM PressFull text available:  [pdf\(2.87 MB\)](#)Additional Information: [full citation](#), [references](#), [citations](#), [index terms](#)**19** Virtualized reality: constructing time-varying virtual worlds from real world events

Peter Rander, P. J. Narayanan, Takeo Kanade

October 1997 **Proceedings of the 8th conference on Visualization '97****Publisher:** IEEE Computer Society PressFull text available:   [pdf\(1.23 MB\)](#)[Publisher Site](#)Additional Information: [full citation](#), [references](#), [citations](#), [index terms](#)**Keywords:** computer vision and scene understanding, dynamic scene analysis, modeling from image sequences, view synthesis, virtual worlds**20** Database system implementation: Performance analysis of a relational data base management system

Paula Hawthorn, Michael Stonebraker

May 1979 **Proceedings of the 1979 ACM SIGMOD international conference on Management of data****Publisher:** ACM PressFull text available:  [pdf\(1.46 MB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#)

The effect on the performance of data management systems of the use of extended storage devices, multiple processors and prefetching data blocks is analyzed with respect to one system, INGRES. Benchmark query streams, derived from user queries, were run on the INGRES system and their CPU usage and data reference patterns traced. The results show that the performance characteristics of two query types: data-intensive queries and overhead-intensive queries, are so different that it may be difficult ...

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